GENERAL MAINTENANCE

INTRODUCTION

This section of the manual contains procedures for changing fuses, using calibration modes for periodic checks of 8100 series Monitor operation, making adjustments, and interpreting alarm codes. Procedures that pertain to temperature determinations apply only to the Model 8100T Monitor.

Some early versions of the 8100 have an AC power switch on the back of the Monitor. When using AC power or charging the battery, with these units, the AC power switch must be in the "I" position.

CHANGING FUSES

The Monitor contains three fuses. Two AC line power fuses are contained in the power entry module. One battery fuse is contained on the power supply board and is accessible only after removing the rear case.

Replacement of Line Power Fuses

If attached, remove the power cord at the rear of the Monitor. Using a flat bladed tool such as a screwdriver, pry up the lower edge of the door below the power connector and swing the door upward on its hinge to reveal the two fuse holders. When replacing these fuses, use only Type 3AG, 0.5 Amp., 250 V, Fast-acting fuses.

Replacement of Battery Fuse

If attached, remove the power cord at the rear of the Monitor. Switch power off at the front panel. Using a Phillips screwdriver, remove the pole clamp knob screw and the five cover hold-down screws.

NOTE

Rotate the pole clamp knob fully counter-clockwise to retract the pole clamp completely before attempting to remove the back cover.

Disconnect the positive battery cable. Locate the battery fuse and inspect it for a burned or broken filament. When replacing this fuse, use only a Type 3AG, 2.0 Amp., 250 V, Fast-acting fuse.

CALIBRATION MODES OF OPERATION

Five calibration modes of operation are provided by the 8100T series software (four for the 8100 series) for viewing certain internal operating

parameters on the front panel displays and for exercising the digital displays. To enter the calibration mode, turn the Monitor **OFF**, press and hold the **SET** switch for 4 seconds after turning power **ON**. The Monitor will enter calibration mode 1. While in calibration, the mode is incremented each time the **SET** switch is pressed, wrapping around from calibration mode 5 to calibration mode 1 and so on. The Monitor automatically switches out of calibration mode and into **MANUAL** mode at the end of three minutes. You may stay in calibration mode indefinitely, or until you press **CANCEL**, by holding the **SET** switch when turning power **ON** until a short beep (about 20 seconds) is sounded.

On the Model 8100T, the **MAP** display is replaced by the **TEMPERATURE** display.

Calibration Mode 1

When calibration mode 1 is entered, the Monitor performs an auto-zero and then displays the following information in the four, main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

MAP/TEMPERATURE Display. The **MAP/TEMPERATURE** display will show pressure in mmHg applied to the **CUFF** E port. If this port is open to atmosphere, the display should be 0, +1/-0.

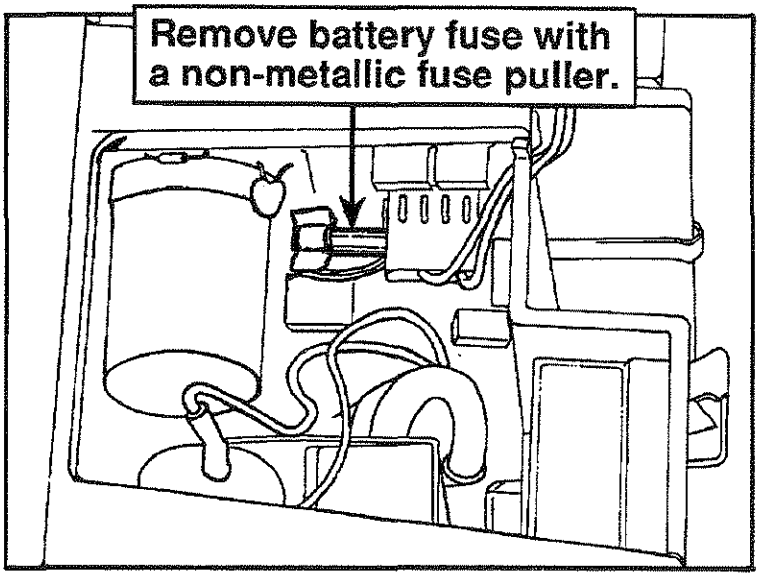
PULSE Display. The **PULSE** display will show a numeric code representing the alphabetical revision level of the software installed in the Monitor EPROM.

SYSTOLIC Display. The **SYSTOLIC** display will show the battery bus voltage (Vb) in volts (no decimal point). The display may be anything from 104 (10.4 Vdc) to 150 (15.0 Vdc) depending on the charge of the battery and whether or not the battery charger (**MAINS AC**) is on. Voltages under 11.8 Vdc will be flashed along with the **BATTERY** indicator (indicating low battery).

DIASTOLIC Display. The **DIASTOLIC** display will show the transducer excitation voltage (TP18 on the CPU board). Normal readings should be between 81 (0.81 Vdc) and 99 (0.99 Vdc). Readings outside this range will cause the display to flash.

Typical normal displays are shown in Figure 1.

Remove the pole clamp knob and the rear cover. Disconnect the battery cable spade lug. Locate the battery fuse and remove it with an insulated fuse puller, or equivalent. Inspect the fuse for a burned or broken filament. If the filament appears to be intact, check it for continuity with an ohmmeter. Replace the blown fuse with one of the specified rating and type.



3.3 CALIBRATION MODES OF OPERATION

Five calibration modes of operation are provided for viewing certain internal operating parameters on the front panel displays and for exercising the digital displays. Modes 1 through 4 apply to both Model 9300 and Model 9340 Monitors. Mode 5 is for temperature functions and only applies to the Model 9340 Monitor.

To place the Monitor in the calibration mode, press **OFF** then press and hold **SET** while pressing **ON**. Continue to hold **SET** for 4 seconds. The Monitor then enters calibration mode 1. The Monitor performs an autozero each time it changes calibration modes. The Monitor increments through the modes each time you press **SET**, wrapping around from the last mode to calibration mode 1 and so on. The Monitor automatically returns to the **MANUAL** mode at the end of three minutes. The Monitor will stay in calibration mode indefinitely, or until you press **CANCEL**, if you continue to hold **SET** for 20 seconds instead of 4. A short beep sounds after 20 seconds.

On the Model 9340 Monitor, the **MAP** display is replaced by the **TEMPERATURE** display.

3.3.1 Calibration Mode 1

Press and hold **SET** while pressing **ON**. Continue to hold **SET** for 4 seconds. The Monitor then enters calibration mode 1 and performs an auto-zero. Observe the following information in the four main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

MAP Display. The **MAP** display (**TEMPERATURE** display on Model 9340 Monitor) shows pressure in mmHg applied to the **CUFF** ⚠ port. If this port is open to atmosphere, the display should be 0, +1/-0.

PULSE Display. The **PULSE** display shows a numeric code representing the alphabetical revision level of the software installed in the Monitor EPROM. These numeric codes are defined in Table 3-1.

Table 3-1. Software Revision Level Numeric Codes

MINOR REVISION LETTER

(typically indicates an enhancement or bug fix since the previous revision)

MAJOR REVISION LETTER

(Indicates significant redesign and/or hardware incompatibility with other versions)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
B	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
C	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
D	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
E	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129
F	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155
G	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181
H	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
I	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233
J	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259
K	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285
L	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311
M	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337
N	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363
O	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389
P	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415
Q	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441
R	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467
S	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493
T	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519
U	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545
V	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571
W	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597
X	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623
Y	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649
Z	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675

SYSTOLIC Display. The **SYSTOLIC** display shows battery bus voltage Vb in volts with no decimal point. The display may be anything from 104 (10.4 Vdc) to 150 (15.0 Vdc) depending on the charge of the battery and whether or not battery charger **MAINS AC** is on. Voltages under 11.8 Vdc indicate low battery and are flashed along with the **BATTERY** indicator.

DIASTOLIC Display. The **DIASTOLIC** display shows the transducer excitation voltage at TP18 on the system processor PWA. Normal readings should be between 81 (0.81 Vdc) and 99 (0.99 Vdc). Readings outside this range causes the display to flash.

Typical normal displays are shown in Figure 3-1.

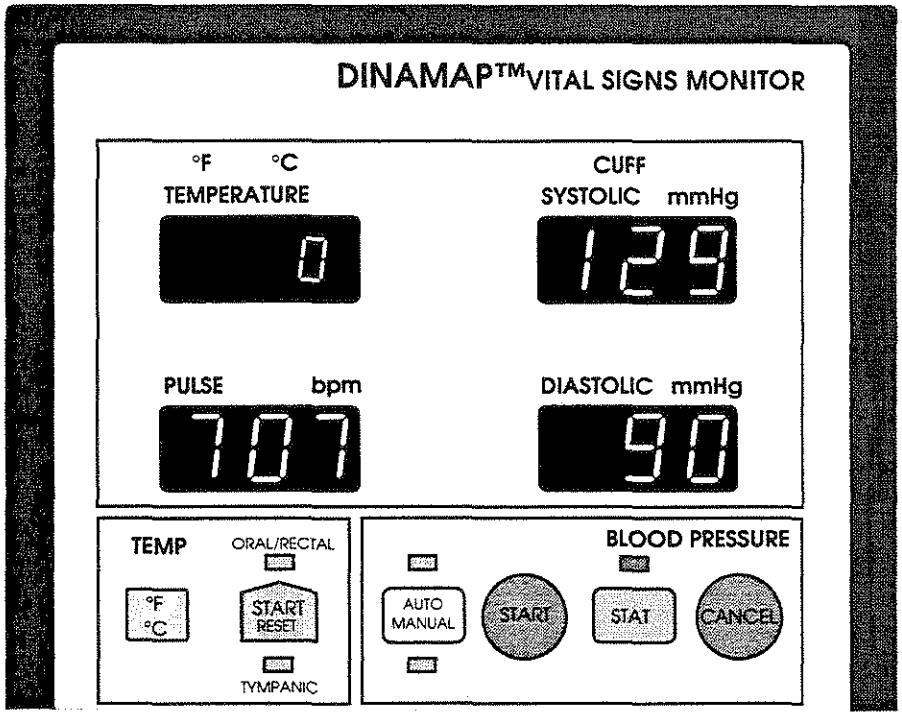


Figure 3-1. Typical Calibration Mode 1 Displays

3.3.2 Calibration Mode 2

Press **SET** a second time to place the Monitor in calibration mode 2. Observe the following information in the four, main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

MAP Display. The **MAP** display (**TEMPERATURE** on the Model 9340 Monitor) shows pressure in mmHg applied to the **CUFF** ⚠ port. If this port is open to atmosphere, the display should be 0, +1/-0.

PULSE Display. The **PULSE** display shows the zero offset applied by the microprocessor during the autozero. This value may range from -50 to -1 mmHg depending on the environmental temperature and the drift characteristics of the transducer and amplifier circuit. At room temperature, this range should be -18 to -32. Typically, this is -25.

SYSTOLIC Display. The **SYSTOLIC** display shows filtered pressure transducer FPT dc offset in A-to-D units. Typically, this value is 10 ±1. If this value is out of range, it is an indication that the FPT amplifier circuitry is faulty.

DIASTOLIC Display. The **DIASTOLIC** display shows the output of the pressure channel when 50 mmHg offset signal DASH50-1 is applied. This should be in the range of 49 to 53 (typically 51). This offset is checked every time an auto-zero is performed. For readings outside this range, the microprocessor generates a 924 hardware alarm.

Typical normal displays are shown in Figure 3-2.

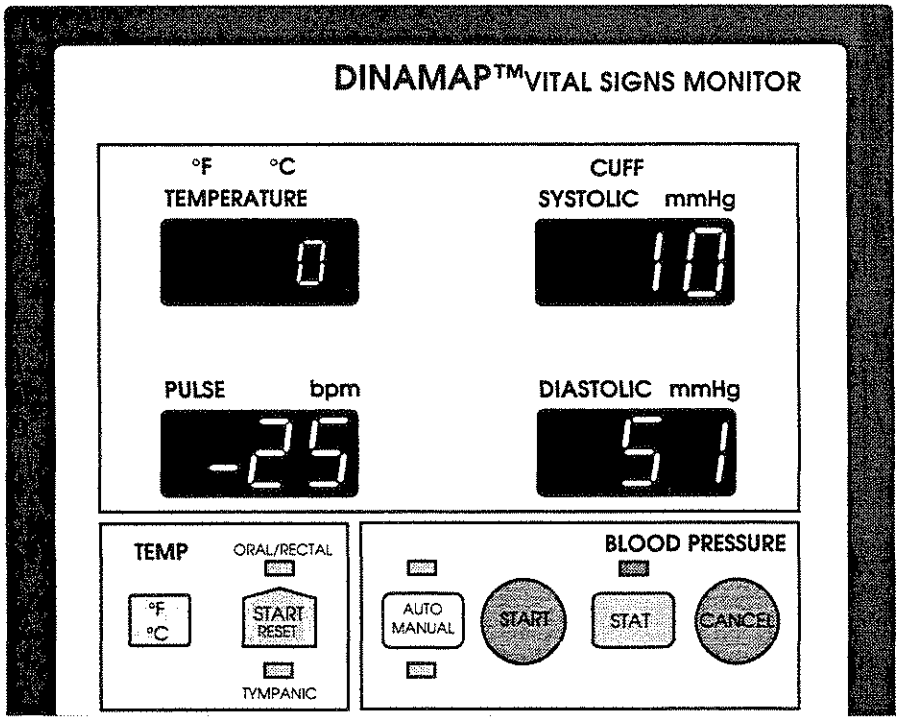


Figure 3-2. Typical Calibration Mode 2 Displays

3.3.3 Calibration Mode 3

Press **SET** a third time to place the Monitor in calibration mode 3. Observe the following information in the four, main digital displays (a flashing 88 is shown in the **B.P. CYCLE MINUTES** window):

MAP Display. The **MAP** display (**TEMPERATURE** on the Model 9340 Monitor) shows the measured +5 Vdc supply. The normal range of the display is 46 (+4.6 Vdc) to 54 (+5.4 Vdc). Values outside this range causes the display to flash and causes the microprocessor, during normal operation, to generate the 911 hardware alarm.

PULSE Display. The **PULSE** display shows the measured -6 Vdc supply. The normal range of the display is -50 (-5.0 Vdc) to -80 (-8.0 Vdc). Values outside this range causes the display to flash and causes the microprocessor, during normal operation, to generate the 913 hardware alarm.

SYSTOLIC Display. The **SYSTOLIC** display shows the measured +8 Vdc supply. The normal range of the display is 72 (+7.2 Vdc) to 88 (+8.8 Vdc). Values outside this range causes the display to flash and causes the microprocessor, during normal operation, to generate the 912 hardware alarm.

DIASTOLIC Display. The **DIASTOLIC** display shows battery charging voltage Vbc. The normal range of the display is 0 (0 Vdc) to 320 (+32.0 Vdc) depending on the state of charge of the battery and the AC line voltage and whether or not the AC power is applied to the Monitor.

Typical normal displays are shown in Figure 3-3.

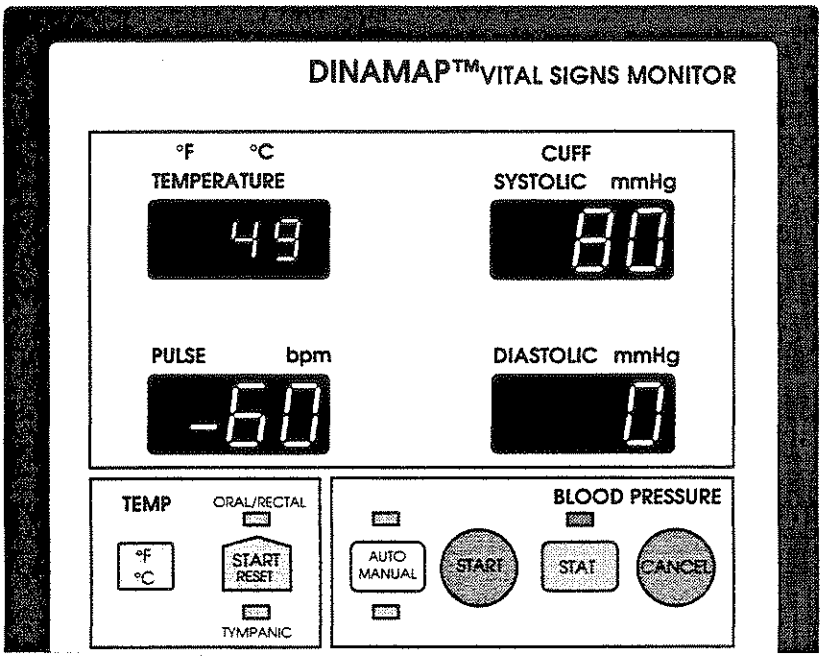


Figure 3-3. Typical Calibration Mode 3 Displays

3.3.4 Calibration Mode 4

Press **SET** a forth time to enter calibration mode 4. Observe that all front panel LEDs are exercised in the following sequence:

SEQUENCE	ACTION
1	Displays zeroes in all the digital displays.
2	Displays ones in all the digital displays.
3	Displays twos in all the digital displays.
4	Displays threes in all the digital displays.
5	Displays fours in all the digital displays.
6	Displays fives in all the digital displays.
7	Displays sixes in all the digital displays.
8	Displays sevens in all the digital displays.
9	Displays eights in all the digital displays.
10	Displays nines in all the digital displays.
11	Displays a "walking eight" in all the digital displays.
12	Sequentially turns on and off each point LED and then repeats the sequence starting with 1.

3.3.5 Calibration Mode 5

On the Model 9340 Monitor, press **SET** a fifth time to place the Monitor in calibration mode 5.

NOTE

The Model 9300 has no mode 5 and returns to mode 1 if the **SET** key is pressed again.

The Monitor is now in state 1 as shown in Table 3-2. You may select different temperture measurement channels by pressing **HIGH** to increment or **LOW** to decrement through states 1, 2, 3 or 4. As you select states 1 through 4, observe the **TEMPERATURE** window for the number of transitions during a 1.5 second time frame and the corresponding offset window and value.

Table 3-2. Calibration Mode 5 Channel Selection

STATE	CHANNEL	TEMPERATURE WINDOW DISPLAYS	OFFSET		VFC TRANSITIONS UPDATED
			WINDOW	NOM. VALUE	
1	3	N/A	SYSTOLIC, DIASTOLIC, and PULSE	0	once
		0 with no probe; 956 with cal plug attached	TEMP-ERATURE	depends on temperature input connection	every 1.5 sec
2	0	57	SYSTOLIC	0	every 1.5 sec
3	1	948	DIASTOLIC	0	every 1.5 sec
4	2	1154	PULSE	0 with blue probe -30 with red probe	every 1.5 sec

3.4 PERIODIC MAINTENANCE

Periodic maintenance tasks include cleaning the Monitor, checking pressure calibration, checking for pneumatic leaks, checking the overpressure cutout switch, and checking the temperature calibration.

3.4.1 Monitor Cleaning

The exterior of the Monitor may be wiped clean with a cloth slightly dampened with mild detergents or normal hospital bactericides.

- Do ***not*** immerse unit.
- Do ***not*** clean with isopropyl alcohol or other solvents.
- The adult cuffs supplied for use with this Monitor may be cleaned by hand washing in warm soapy water. Care should be exercised, however, to ensure that no water enters the cuff or cuff hoses at any time. Should water accidentally enter the cuff it may be dried by passing air through the cuff.
- The neonatal cuffs are supplied for single use and should be discarded if they become soiled.
- Do ***not*** immerse hoses.
- Do ***not*** immerse cuffs without prior application of cuff hose caps.

CAUTION

Calibration equipment should always be kept dry and free of particulate matter. Moisture or foreign substances introduced into the pneumatic system can cause damage to the unit.